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**UTILITY PATENT APPLICATION TRANSMITTAL**  
**(Large Entity)***(Only for new nonprovisional applications under 37 CFR 1.53(b))*Docket No.  
RCA89605

Total Pages in this Submission

**TO THE ASSISTANT COMMISSIONER FOR PATENTS**Box Patent Application  
Washington, D.C. 20231

Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application for invention entitled:

**APPARATUS AND METHOD FOR REDUCING THE VISUAL EFFECTS OF ARTIFACTS PRESENT IN A LINE  
SCANNED VIDEO DISPLAY**

and invented by:

**KEEN, Ronald Thomas**If a **CONTINUATION APPLICATION**, check appropriate box and supply the requisite information:☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: \_\_\_\_\_

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Enclosed are:

**Application Elements**

1. ☒ Filing fee as calculated and transmitted as described below
2. ☒ Specification having Eight (8) pages and including the following:
  - a. ☒ Descriptive Title of the Invention
  - b. ☒ Cross References to Related Applications *(if applicable)*
  - c. ☐ Statement Regarding Federally-sponsored Research/Development *(if applicable)*
  - d. ☐ Reference to Microfiche Appendix *(if applicable)*
  - e. ☒ Background of the Invention
  - f. ☒ Brief Summary of the Invention
  - g. ☐ Brief Description of the Drawings *(if drawings filed)*
  - h. ☒ Detailed Description
  - i. ☒ Claim(s) as Classified Below
  - j. ☒ Abstract of the Disclosure

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**Application Elements (Continued)**

3. ☐ Drawing(s) *(when necessary as prescribed by 35 USC 113)*
- a. ☐ Formal                      Number of Sheets \_\_\_\_\_
- b. ☐ Informal                      Number of Sheets \_\_\_\_\_
4. ☐ Oath or Declaration
- a. ☐ Newly executed *(original or copy)*                      ☐ Unexecuted
- b. ☐ Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional application only)*
- c. ☐ With Power of Attorney                      ☐ Without Power of Attorney
- d. ☐ DELETION OF INVENTOR(S)  
Signed statement attached deleting inventor(s) named in the prior application,  
see 37 C.F.R. 1.63(d)(2) and 1.33(b).
5. ☐ Incorporation By Reference *(usable if Box 4b is checked)*  
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. ☐ Computer Program in Microfiche *(Appendix)*
7. ☐ Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all must be included)*
- a. ☐ Paper Copy
- b. ☐ Computer Readable Copy *(identical to computer copy)*
- c. ☐ Statement Verifying Identical Paper and Computer Readable Copy

**Accompanying Application Parts**

8. ☐ Assignment Papers *(cover sheet & document(s))*
9. ☐ 37 CFR 3.73(B) Statement *(when there is an assignee)*
10. ☐ English Translation Document *(if applicable)*
11. ☒ Information Disclosure Statement/PTO-1449                      ☒ Copies of IDS Citations
12. ☐ Preliminary Amendment
13. ☒ Acknowledgment postcard
14. ☒ Certificate of Mailing
- ☐ First Class                      ☒ Express Mail *(Specify Label No.):* **EL533625294US**

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**Accompanying Application Parts (Continued)**

15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)

16. ☐ Additional Enclosures (please identify below):

**Fee Calculation and Transmittal**

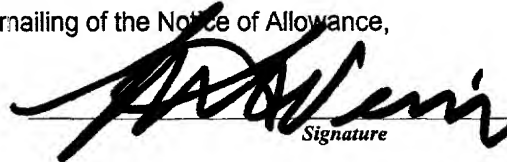
**CLAIMS AS FILED**

For	#Filed	#Allowed	#Extra	Rate	Fee
Total Claims	24	- 20 =	4	x \$18.00	\$72.00
Indep. Claims	2	- 3 =	0	x \$78.00	\$0.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					\$0.00
BASIC FEE					\$760.00
OTHER FEE (specify purpose)					\$0.00
TOTAL FILING FEE					\$832.00

- ☐ A check in the amount of \_\_\_\_\_ to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge and credit Deposit Account No. 07-0832 as described below. A duplicate copy of this sheet is enclosed.
- ☒ Charge the amount of \$832.00 as filing fee.
  - ☒ Credit any overpayment.
  - ☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
  - ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Dated:

12/16/99

  
Signature

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EXP. MAIL EL533625294US

**APPARATUS AND METHOD FOR REDUCING THE VISUAL EFFECTS OF  
ARTIFACTS PRESENT IN A LINE SCANNED VIDEO DISPLAY**

**FIELD OF THE INVENTION**

- 5                   The present invention relates to the processing of video signals, and more particularly, to the amelioration of artifacts introduced by periodic signals leaking or introduced into the luminance channel of a color television receiver.

**BACKGROUND**

- 10                   As a review, for an NTSC color television signal, the spectral energy of the luminance (Y) signal is essentially centered at harmonics of the line scanning frequency  $nf_h$  where  $n$  is an integer. Thus, a luminance signal typically has frequency components of  $1f_h$ ,  $2f_h$ ,  $3f_h$ ,  $4f_h$ , etc. The chrominance (C) signal spectral energy peaks occur at odd harmonics of one half the line scanning  
15 frequency, i.e.,  $(n+1/2)f_h$  where  $n$  is an integer. Thus, the Y and C energy spectra are frequency interleaved.

- U.S. Patent No. 4,607,286 of Weimer concerns the electrostatic coupling of forward clocking signals in a CCD imager to the underlying bulk semiconductor substrate which introduces transient disturbances leaving visible  
20 artifacts in television pictures reconstructed from the video signals generated from the CCD imager. An additional clocked delay places the disturbances into the line retrace interval and the disturbances are removed from the video signals by line retrace blanking.

- U.S Patent Nos. 4,291,330 and 4,134,126, both of Hirai, teach that in  
25 a color video recorder, an interfering or cross-talk signal having a frequency  $(n+1/2)f_h$  will have a frequency interleaved relationship to the frequency of the main luminance components with the result that the cross-talk signal will be phase inverted in successive horizontal lines of the video signals, and that since there is a high correlation between the reproduced luminance components in successive  
30 horizontal line intervals, the cross-talk signals will not appear as a conspicuous noise or beat on an image reproduced on a cathode ray tube but will be largely visually canceled.

- U.S. Patent No. 4,003,077 of Hickock concerns a color video recorder wherein the chrominance information is frequency converted before

recording to a frequency to render, upon display, an artifact pattern of one line of the picture frame being 180 degrees out of phase with the artifact pattern of an adjacent line, so that the resultant artifact pattern, although present, seemingly disappears due to the integrating effect of the eye of the viewer.

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### **SUMMARY OF THE INVENTION**

During production of a video processing integrated circuit having, inter alia, a graphics generator, a video processor, and a spread spectrum clock, it was discovered that the signal for FM modulating the carrier signal of the clock, 10 due to internal signal leakage within the chip, caused an artifact to appear when viewed on a line scanned video display, e.g., a cathode ray tube. Rather than undertake the extensive and expensive redesign of the integrated circuit to eliminate the artifact, since the frequency of the interfering signal was selectable, it was decided to select the frequency of the interfering signal so that the frequency 15 would be an odd harmonic of one half the horizontal line scan frequency. By making the particular selection of frequency to be an odd harmonic of one half of the horizontal line scan frequency, adjacent scan lines of the artifact are 180 degrees out of phase with each other. Thus, the artifact is rendered largely visually canceled when viewed on a line scanned display, due to the integrating 20 characteristics of the eye of the viewer, even though the artifact is still there.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

The exemplary embodiment of the present invention concerns an integrated circuit number W49C31-20A which is a low-power CMOS monolithic 25 chip made by the IC Works of San Jose, California, USA, and includes a graphics processor, a video processor and a spread spectrum clock. The present invention concerns a video processor wherein a signal having a frequency within the video passband "leaks" into the video processor, and in the exemplary embodiment, the leaked signal, which produces an artifact on a video display, is derived from the 30 modulation signal of a spread spectrum clock. It should be noted however, for purposes of the present invention, that the leaked artifact producing signal can be derived from any source, and leaked or introduced into any common video processor. Thus, the construction and circuitry of the exemplary chip including the exemplary video processor, the exemplary spread spectrum clock, and the

exemplary generation of the modulation signal for the spread spectrum clock, all form no part of the present invention.

It is believed that the artifact creating signal leaks into the video path by electrostatic and/or capacitive coupling either between sections, or through  
5 electrostatic and/or capacitive coupling by the respective structures with the semiconductor substrate material. The artifact creating signal in the exemplary embodiment, is the modulation signal of a spread spectrum clock which falls within the video passband of up to 10 MHz. The carrier signal for the clock is outside of the video passband, i.e., 85 MHz, but if it fell within the video passband, or any  
10 other frequency selectable, periodic, artifact producing signal fell within the video passband, the present invention would be equally applicable in order to "hide" the produced artifact.

More particularly, during production of the monolithic integrated circuit it was discovered that the signal for FM modulating the carrier signal of the  
15 clock, due to internal signal leakage within the chip, caused an artifact to appear when viewed on a line scanned video display such as a cathode ray tube. Rather than undertake the extensive and expensive redesign of the integrated circuit to eliminate the artifact, it was decided to take an alternate approach.

The frequency of the interfering signal was selectable. Thus, it was  
20 decided that since the frequency was selectable, to select the frequency of the interfering signal so that the signal frequency would be an odd harmonic of one half the horizontal line scan frequency commonly referred to as  $f_h$ , which for an NTSC signal is 15,734.26573 Hz. Thus, the particular selection of frequency of the interfering modulation signal of the spread spectrum clock was 39.336 kHz (2.5  
25 multiplied by  $f_h$ ), which can be rounded up or down to the nearest integral kHz of 39 kHz or 40 kHz.

For such a harmonic relationship to  $f_h$ , the artifact displayed on adjacent scan lines on the line scanned display are 180 degrees out of phase with each other. Thus, the artifact is rendered largely visually canceled when viewed  
30 due to the integrating characteristics of the eye of the viewer, even though the artifact is still there. This is true for both interlaced and progressive scan frames except that one line at the top or bottom of each interlace field will not appear to be canceled. The line having the visually unreduced artifact can be placed in the

vertical overscan portion of picture, and thus will be hidden, or can be hidden by vertical blanking.

Further, the interfering signal is also frequency interleaved with the luminance signal, as discussed above in the background section. The frequency  
5 interleaving further reduces artifacts.

The present invention is applicable to the choice of the frequency of a periodic signal within the video passband, leaked or intentionally introduced by whatever means, into a video signal path of whatever means, which causes an artifact to appear when viewed on a line scanned display. Such an intentional  
10 introduction of an artifact producing signal into the video path can be, e.g., an information encoded signal. It should be noted that the artifact producing signal of the exemplary embodiment is an information encoded signal but the introduction into the video signal path was unintentional.

**WHAT IS CLAIMED:**

1. In a television receiver having a line scanned video display, a method for reducing the visual effects of an artifact in a line scan portion of the video signal display, the artifact being attributable to a periodic signal within the video pass band coupled to a video processing path of a video circuit, the line scan having a frequency of  $f_h$ , comprising:
  - selecting the frequency of the periodic signal, and
  - predetermining the frequency of the periodic signal to be an odd harmonic of  $f_h/2$ .
2. The method of claim 1 wherein the periodic signal is a clock signal electrostatically/capacitively coupled to the video circuit.
3. The method of claim 2 wherein the electrostatically/capacitively coupled clock signal is an FM modulating signal of a spread spectrum clock.
4. The method of claim 2 wherein the electrostatically/capacitively coupled clock signal is a carrier signal of a spread spectrum clock.
5. The method of claim 1 wherein  $f_h$  is the NTSC standard horizontal scan frequency of 15,734.26573 Hz and the predetermined fundamental frequency of the periodic signal is approximately 39.336 kHz (2.5 multiplied by  $f_h$ ).
6. The method of claim 5 wherein the predetermined fundamental frequency of the periodic signal is rounded up or rounded down to an integral number.
7. The method of claim 1 wherein the predetermined fundamental frequency of the periodic signal is one of rounded up and rounded down to an integral number.
8. The method of claim 2 wherein the video circuit, and the electrostatically/capacitively coupled periodic signal are included within an integrated circuit having an underlying substrate of semiconductor material.
9. The method of claim 8 wherein the electrostatically/capacitively coupling is via respective capacitances coupled to the underlying substrate.
10. The method of claim 1 wherein the periodic signal is electrostatically/capacitively coupled to the video circuit.
11. The method of claim 10 wherein the video circuit, and the electrostatically/capacitively coupled periodic signal are included within a



monolithic integrated circuit having an underlying substrate of semiconductor material.

12. The method of claim 11 wherein the electrostatic coupling is via capacitances to one of the underlying substrate and between component parts of the monolithic integrated circuit.

13. In a television receiver having a line scanned video display, apparatus for reducing the visual effects of an artifact in a line scan portion of the video signal display, the artifact being attributable to a periodic signal within the video passband coupled to a video processing path of a video circuit, the line scan having a frequency of  $f_h$ , comprising:

means for selecting the frequency of the periodic signal, and

means for predetermining the frequency of the periodic signal to be an odd harmonic of  $f_h/2$ .

14. The apparatus of claim 13 wherein the periodic signal is a clock signal electrostatically/capacitively coupled to the video circuit.

15. The apparatus of claim 14 wherein the electrostatically/capacitively coupled clock signal is an FM modulating signal of a spread spectrum clock.

16. The apparatus of claim 14 wherein the electrostatically/capacitively coupled clock signal is a carrier signal of a spread spectrum clock.

17. The apparatus of claim 13 wherein  $f_h$  is the NTSC standard horizontal scan frequency of 15,734.26573 Hz and the predetermined fundamental frequency of the periodic signal is approximately 39.336 kHz (2.5 multiplied by  $f_h$ ).

18. The apparatus of claim 17 wherein the predetermined fundamental frequency of the periodic signal is one of rounded up and rounded down to an integral number.

19. The apparatus of claim 13 wherein the predetermined fundamental frequency of the periodic signal is rounded up or rounded down to an integral number.

20. The apparatus of claim 14 wherein the video circuit, and the electrostatically/capacitively coupled periodic signal are included within an integrated circuit having an underlying substrate of semiconductor material.

21. The apparatus of claim 20 wherein the electrostatically/capacitively coupling is via respective capacitances coupled to the underlying substrate.

22. The apparatus of claim 13 wherein the periodic signal is  
5 electrostatically/capacitively coupled to the video circuit.

23. The apparatus of claim 22 wherein the video circuit, and the electrostatically/capacitively coupled periodic signal are included within a monolithic integrated circuit having an underlying substrate of semiconductor material.

10 24. The apparatus of claim 23 wherein the electrostatically/capacitively coupling is via capacitances to one of the underlying substrate and directly between component parts of the monolithic integrated circuit.

100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

**ABSTRACT**

On a line scanned video display, the frequency of an artifact producing signal within the video passband is selected to be an odd harmonic of one half the horizontal line scan frequency so that adjacent scan lines of the artifact are 180 degrees out of phase with each other. Thus, the artifact is rendered largely visually canceled when viewed due to the integrating characteristics of the eye of the viewer, even though the artifact is still there.